

WHAT IS CLAIMED IS:

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1. A heater control apparatus configured and arranged to be operable by an alternating current having one of a plurality of frequencies, and detecting a zero-cross point of a voltage waveform of the alternating  
10 current to be supplied to a heater so as to generate a zero-cross signal and controlling an electric power supply to the heater by using the zero-cross signal as a reference,

wherein, at a time of tuning a power on, the  
15 frequency of the alternating current is tentatively determined before the frequency is detected so as to control the electric power supply to said heater based on the tentatively determined frequency, and to control the electric power supply to said heater, after the  
20 frequency of the alternating current is detected, based on the detected frequency.

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2. The heater control apparatus as claimed in claim 1, wherein said tentatively determined frequency is a highest frequency from among said plurality of frequencies.

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3. The heater control apparatus as claimed in claim 1, wherein said plurality of frequencies are 50 Hz and 60 Hz, and said tentatively determined frequency is 60 Hz.

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4. The heater control apparatus as claimed in claim 3, comprising:

a zero-cross detection circuit which detects a zero-cross point of the voltage of the alternating current which is supplied to said heater from an alternating current power source part which accepts an alternating current of either 50 Hz or 60 Hz;

a switching circuit which turns on and off the electric power supply to said heater; and

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a control part which controls the on and off said switching circuit at a predetermined timing based on the zero-cross signal output from said zero-cross detection circuit,

5            wherein said control part includes a setting circuit for setting a phase angle timer which determines a timing of turning on said switching circuit, and a frequency detection circuit which detects the frequency of the alternating current supplied to said alternating  
10           current power source part from the zero-cross signal of the zero-cross point of the voltage of the alternating current by said zero-cross detection circuit generated by said zero-cross detection circuit;

             at the time of turning a power on, the  
15           electric power supply to said heater is controlled by setting a timer value of said phase angle timer in accordance with the tentatively determined frequency; and

             the electric power supply to said heater is  
20           controlled, after the frequency of the alternating current is detected by said frequency detection circuit, by setting the timer value of said phase angle timer in accordance with the detected frequency.

5. The heater control apparatus as claimed in claim 4, wherein said control part continues the control of the electric power supply to said heater by setting the timer value of said phase angle timer based on the tentatively determined frequency when the frequency detected by said frequency detection circuit does not match any one of the plurality of frequencies.

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6. The heater control apparatus as claimed in claim 5, wherein said control part stores information in a nonvolatile memory, the information indicating that the frequency detected by said frequency detection circuit does not match any one of the plurality of frequencies and the electric power supply to said heater is continued by setting the timer value of said phase angle timer based on the tentatively determined frequency.

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7. An image forming apparatus comprising:  
a heater control apparatus for controlling a  
heater; and

a fixation device equipped with said heater,  
5 wherein said heater control apparatus is  
configured and arranged to be operable by an alternating  
current having one of a plurality of frequencies, and  
detecting a zero-cross point of a voltage waveform of  
the alternating current to be supplied to a heater so as  
10 to generate a zero-cross signal and controlling an  
electric power supply to the heater by using the zero-  
cross signal as a reference,

wherein, at a time of tuning a power on, the  
frequency of the alternating current is tentatively  
15 determined before the frequency is detected so as to  
control the electric power supply to said heater based  
on the tentatively determined frequency, and to control  
the electric power supply to said heater, after the  
frequency of the alternating current is detected, based  
20 on the detected frequency.

8. The image forming apparatus as claimed in claim 7, wherein said tentatively determined frequency is a highest frequency from among said plurality of frequencies.

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9. The image forming apparatus as claimed in claim 7, wherein said plurality of frequencies are 50 Hz and 60 Hz, and said tentatively determined frequency is 60 Hz.

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10. The image forming apparatus as claimed in claim 9, comprising:

a zero-cross detection circuit which detects a zero-cross point of the voltage of the alternating current which is supplied to said heater from an alternating current power source part which accepts an alternating current of either 50 Hz or 60 Hz;

a switching circuit which turns on and off the electric power supply to said heater; and

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a control part which controls the on and off said switching circuit at a predetermined timing based on the zero-cross signal output from said zero-cross detection circuit,

5            wherein said control part includes a setting circuit for setting a phase angle timer which determines a timing of turning on said switching circuit, and a frequency detection circuit which detects the frequency of the alternating current supplied to said alternating  
10           current power source part from the zero-cross signal of the zero-cross point of the voltage of the alternating current by said zero-cross detection circuit generated by said zero-cross detection circuit;

             at the time of turning a power on, the  
15           electric power supply to said heater is controlled by setting a timer value of said phase angle timer in accordance with the tentatively determined frequency; and

             the electric power supply to said heater is  
20           controlled, after the frequency of the alternating current is detected by said frequency detection circuit, by setting the timer value of said phase angle timer in accordance with the detected frequency.

11. The image forming apparatus as claimed in claim 10, wherein said control part continues the control of the electric power supply to said heater by setting the timer value of said phase angle timer based on the tentatively determined frequency when the frequency detected by said frequency detection circuit does not match any one of the plurality of frequencies.

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12. The image forming apparatus as claimed in claim 11, wherein said control part stores information in a nonvolatile memory, the information indicating that the frequency detected by said frequency detection circuit does not match any one of the plurality of frequencies and the electric power supply to said heater is continued by setting the timer value of said phase angle timer based on the tentatively determined frequency.

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13. A heater control method of a heater  
configured and arranged to be operable by an alternating  
current having one of a plurality of frequencies, the  
heater control method detecting a zero-cross point of a  
5 voltage waveform of the alternating current to be  
supplied to a heater so as to generate a zero-cross  
signal and controlling an electric power supply to the  
heater by using the zero-cross signal as a reference,  
the heater control method comprising the steps  
10 of:  
tentatively determining, at a time of tuning a  
power on, the frequency of the alternating current  
before the frequency is detected;  
controlling the electric power supply to said  
15 heater based on the tentatively determined frequency;  
and  
controlling the electric power supply to said  
heater, after the frequency of the alternating current  
is detected, based on the detected frequency.

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14. The heater control method as claimed in  
25 claim 13, wherein selecting, as said tentatively

determined frequency, a highest frequency from among said plurality of frequencies in the step of tentatively determining the frequency.

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15. The heater control method as claimed in claim 14, wherein said plurality of frequencies are 50 Hz and 60 Hz, and selecting 60 Hz as said tentatively determined frequency.

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16. The heater control method as claimed in claim 15, wherein  
controlling the electric power supply to said heater, at the time of turning a power on, by setting a timer value of a phase angle timer in accordance with the tentatively determined frequency, the phase angle timer determining a timing of turning on a switching circuit; and

controlling the electric power supply to said heater, after the frequency of the alternating current

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is detected, by setting the timer value of said phase angle timer in accordance with the detected frequency.

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17. The heater control method as claimed in claim 16, further comprising a step of continuing the control of the electric power supply to said heater by  
10 setting the timer value of said phase angle timer based on the tentatively determined frequency when the detected frequency does not match any one of the plurality of frequencies.

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18. The heater control method as claimed in claim 17, further comprising a step of storing information in a nonvolatile memory, the information  
20 indicating that the frequency detected by said frequency detection circuit does not match any one of the plurality of frequencies and the electric power supply to said heater is continued by setting the timer value of said phase angle timer based on the tentatively  
25 determined frequency.